

"HOSPITAL PLANS,"

CONDENSED

FOR THE USE ONLY OF THE TRUSTEES OF THE

JOHNS HOPKINS HOSPITAL.

1875.



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NOTE.—The following Condensation of the five Essays prepared for the Trustees of the Johns Hopkins Hospital was made by the writer while studying them; he now submits it to the Trustees, with an index, hoping it may facilitate the examination of subjects, in the large volume.

Only those points of organization and administration are noticed which bear upon the construction of the buildings, the arrangement of the grounds, and the hygiene of the Hospital.

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"HOSPITAL PLANS,"

CONDENSED.

JNO. S. BILLINGS, M. D.

The PLAN FOR THE ORGANIZATION OF THE HOSPITAL will depend to some extent upon the character and extent of its connection with the *Medical School*.
Pages 3 to 5.

The Medical School should not be large, but of a very high standard—quality not quantity.

The Hospital should subserve, first, the comfort and best interest of patients, and second, the education of Physicians and Nurses.

A Physiological Laboratory should be connected with the Pathological Department of the Hospital.

The Professors of the Medical School should furnish the medical and surgical advice required by the Hospital and Dispensary.

The Resident Physicians should be graduates of the Medical School, selected by competitive examinations.

The interests of the Hospital and Medical School are inseparable. The Hospital has not only to care for the sick and educate physicians and nurses, but should add a third duty, promote discoveries in the science and art of medicine, and make them known for the general good.

The hygienic management must not be put upon the attendant or resident physicians—it must be a *special* duty,

and is more important than any thing connected with the Hospital.

The Medical School should not be on the Hospital grounds,—it should not be far away.

ORGANIZATION AND GENERAL PLAN OF MANAGEMENT.

The Hospital should have one head—a
Pages 6 to 11. “Physician-in-charge.” He should have charge of the Hygiene of the Hospital, in general and particular; he should be the Health Officer as well as the official Head. He should not make appointments or purchases, nor should he be connected with the Medical School. He should be appointed now, and report a plan of organization to the Trustees.

The number of physicians, students, and other officers are given on page 7.

Rules for admission of patients, on page 8.

A central business office in the city, with a telegraph to the Hospital, and two ambulances should be provided.

A system of records should be adopted—financial—historical—and professional—and an annual volume of reports of interesting cases be published.

A Dispensary for out-door relief, to be entirely separated from the administrative building.

A Theatre, to be used for surgical cases. Clinical instruction should be given in wards and dispensary, if the Medical School is organized on a high grade.

Dispensary accounts to be kept separately.

A Pathological Laboratory is important.

HOSPITALISM arises from impure air and
Pages 11 to 18. minute particles from the bodies of patients, called disease germs, of great vitality—dilution of the air

will not give security, and disinfection will not; isolation should be resorted to, and classification should be carried much further than is usually done:

TEMPORARY *versus* PERMANENT HOSPITALS.

He advised in 1870 that temporary Hospitals should be constructed—he now thinks the statement too sweeping. He does not think all Hospitals should be periodically destroyed, especially all parts.

Barrack Hospitals will not prevent Hospitalism.

Tents are better for wounds and acute diseases.

Barracks have advantages in cost and ventilation—the question of stories is separate from permanence. No trouble to warm them. The principal difficulty is inability to enforce discipline and supervision, and the cost of administration.

Is of opinion that all the good qualities of the Tent or temporary Barrack Hospital can be combined with those of permanent structure.

HEATING.

The extremes of Temperature are from Zero to 100° in Baltimore. Special provision must be made for heating three months in winter by hot water or steam;—air thus heated, and sent into the room. Hot water less manageable than steam in sudden changes—a heater under each building preferable to one large one for all.

Open fire-places are cheerful, but in large pavilions they are only useful as ventilators—and that can be better and more steadily done by inserting coils of pipe in shafts in the centre of the pavilions. Fire-places in small rooms.

VENTILATION.

The mode of Ventilation must differ in cold
Pages 21 to 25. and warm weather.

In Winter.—1st Mode.—Secure distribution by introducing warm air at the floor through numerous apertures, and taking it out at the ceiling, carrying up and out the impurities—theoretically this is the best, but the most costly mode.

2d Mode.—Introduce the heated air at the top and remove it at the bottom—the most economical method—it mixes and dilutes the air. A system of dilution rather than removal will not work well in all weathers.

3d Mode.—Introduce the heated fresh air at the bottom and discharge it also at the floor. Have the aspirating shaft in the centre of the rooms where it works best. The heating of Hospitals and the mechanical work to be done in them by steam is always more costly than in other buildings of same size.

In Summer.—Ventilating by the natural system is better accomplished with sloping or peaked ceilings. That is one of the advantages of one story buildings, but with full ridge ventilation they are more difficult to heat in winter.

Natural ventilation cannot be relied on in still warm weather—he recommends the *fan* for ventilating, and to some extent for cooling the air in warm weather.

The first system will cost \$10,000 more per annum for the entire Hospital than the second, and he thinks this annual sum can be better employed. He would adopt the second and the *fan*—except in one pavilion, where he would try the first for experiment.

An aspirating chimney for each pavilion must be eight square feet, and he would give each pavilion its own heating and ventilating apparatus. If one central aspirating

shaft is adopted, it must be 130 feet high and 8 feet in diameter at the top.

BUILDINGS — PAVILIONS.

He gives diagrams of one and two story pavilions on page 26.

Pages 26 to 32.

In the two story pavilion he has the lift, dumb waiter, and stairway to open only to the outer air, and fewer windows, on account of heating and ventilating in winter. He objects to dust flues and clothes shutes, and substitutes tight fitting galvanized iron boxes on rubber bound wheels. He has a few isolated rooms on each floor of the pavilions, for acute, febrile or doubtful cases. Wards not less than 26 feet wide and not over 30 feet wide. Reduce some pavilions to 20 patients and increase the isolating rooms. The one story Surgical Ward should have more wall space for each patient.

The pavilions should have *basements* nine feet high, *entirely above ground*—floored with asphalt, to contain nothing but ventilating and heating apparatus, to communicate with centre building by a corridor ten feet wide, the *top* to be an *open corridor* leading to the ward floor.

This will give control over the movements of convalescent patients and visitors, and the corridors themselves will not interfere with ventilation.

The question of one and two story pavilions is totally distinct from that of permanence. No authoritative answer can be given as to the advantages of one story structures, for the reason that there are no trustworthy observations as to their relative healthfulness. The argument in favor of one story barrack pavilions is their ventilation.

“Although the most satisfactory wards I have seen tested have been one story barrack structures, I must say that I have not found any reliable evidence as to the unhealthfulness of two story buildings, on account of their height, even as usually constructed, and I never have seen a two story pavilion or the plan of one, in which the upper story was entirely cut off from the lower, which can be easily effected, and removes one of the greatest objections to this plan.”

Thinks the employment of two story pavilions for 75 per cent. of the patients would not produce any difference in results as to health, while in economy of construction and management, and in the control of patients, two story pavilions present advantages which should not be overlooked.

The restraint of the vicious must not be forgotten, as most of the patients are brought into City Hospitals by alcohol and venery. The discipline in all respects is better in two story pavilions.

He advises, “not without hesitation,” that a part of the pavilions be two story—but *the decision must turn upon how the buildings are to be arranged.*

The *walls* should have a good hard finish, but not be impermeable. A soiled coat, stuffed chair or screen is more dangerous than walls.

All *corners* should be rounded, and all *gaslights* should contribute to ventilation by passing off the products of combustion through tubes into foul air ducts. *Window sills* should be of slate, and the *wood work* not be painted or varnished.

The difficulty of ventilating the lower ward of a pavilion which occurs from flat ceilings and dead air space can be overcome by carrying four inch shafts from the ceiling of

The Emergency Notes of
Surgical Path 2 F.R.C.
and
Surgeon to St. Bartholomew's Hospital
Beall's note

Injuries to the Head
Fistula lachrymalis
Hydrocele.

Fistula in Groin -
Fractures of the Orbit

Cataract -

Polyposis of the nose
Can ear secrete

Rhinitis
Morphology of the Nose & Throat

End

Spencer - p 254

" In general practice, they are made of such length, as not to reach either upward or downward, so far as the collar extends, not to encumber the upper or the lower part of the broken bone, and to be such that the fracture surface may not remain uncleaned. They do not, for example, in the broken leg, comprehend either the joint of the knee or the joint of the ankle, and act only on the fracture."

This he says is wrong.

They should reach beyond the joints.

"Adhesive plaster of all
kinds, let the composition
be what they may"
bad in fractures - 644

use bandages

the lower room through the upper one into the roof, and they would appear as columns in the upper ward.

All water closets and sinks should ventilate downwards.

ADMINISTRATIVE BUILDINGS.

They should consist of three parts—1st, Pages 33 to 39. the administrative building, containing the business offices, reception rooms, apothecary's room, officers' dining room, &c. &c.

The second building, containing kitchen, laundry, store rooms, &c.; the kitchen and laundry on third floor, using lifts, a large convalescents' dining room near kitchen; some question of this; probably four central ones would be better where there is so much subdivision of patients. The building for boiler, engines and fan to be disconnected. He strongly advises hot water for heating.

The third building to contain the amphitheatre, dispensary, dead-house and pathological laboratory.

"The Physician-in-charge" should have a separate house on or near the grounds. Chapel separate also, and to be used as a reading room in the week.

The daily use of water would be 22,500 gallons, and he recommends underground storage tanks to hold 50,000 gallons in case of accident.

GENERAL PLAN OF HOSPITAL.

He proposes to prevent the causes of un- Pages 39 to 44. healthfulness from being present in the greater part of the buildings, and to confine them to certain structures, which may be purified or destroyed. This to be done by more than usual classification and isolation, and by destruction of the causes of disease as they occur.

Patients require different degrees of heat in different diseases, and often in the same disease. The same is true in regard to light. Would separate acute from chronic and convalescent cases. The powers and action of light not yet fully understood. It is a great tonic.

He shows by a classified table of patients, that 24-bed wards should be the largest, and that numerous smaller wards would be desirable.

His classification for 400 patients is as follows :

White male, Medical, 75	Black male, Medical, 25
“ “ Surgical, 75	“ “ Surgical, 25
“ female, Medical, 30	“ female, Medical, 25
“ “ Surgical, 30	“ “ Surgical, 25
Children, male, . . 25	Private patients, . . 40
“ female, . . 25	—
Total, 400	

About 25 per cent., excluding private patients, would require more or less isolation—say 90 beds. Each ward should be emptied in rotation, so that *one would always be vacant*, airing.

The pavilions should run north and south, and should be totally disconnected from each other and from the administration buildings;—two story pavilions should be 100 feet apart, one story ones from 50 to 75 feet.

Recommends that the amphitheatre and buildings connected with it be cheaply constructed at first, to be enlarged with the growth of the school.

He estimates Plan, Plate 4, permanent one story pavilions, at \$386,000, and Plan, Plate 5, two and one story pavilions, at \$392,000: the management of the latter \$10,000 less per year. These estimates do not include grading, sewers, planting, railing, gateways, &c.

He prefers the combined two and one story plans shown on Plates 5 and 6.

He would front on Broadway and arrange the pavilions with the long axis north and south, for sun and air. The pavilions can be added as they are needed if deemed best.

Whatever plan may be adopted he strongly recommends about 15 U. S. army pattern hospital tents, to be used as isolating wards, each 14 feet long, $4\frac{1}{2}$ high at sides, and 11 feet at centre. French floors and heating apparatus—or steam pipes from nearest pavilion. Cost of tent \$100—wear two to three years.

Sewers should be ventilated by one or more shafts, higher than the buildings, and separate from the aspirating chimneys.

He would provide many things not enumerated in his essay—such as compressed and rarified air, electricity, sun baths, &c. &c.

He says, the present condition of our knowledge is imperfect, too theoretical. Would reserve some funds to make changes which will be found to be desirable, adopt what plan we may.

NORTON FOLSOM, M. D.

Simplicity has a beauty all its own.
 Pages 49 to 52. You have an opportunity for lateral expansion seldom attainable in a metropolitan Hospital, and this will render more complete the classification of patients.

This CLASSIFICATION would be

Private rooms, male, female, medical and surgical, in common.

Male medical wards.

Female medical wards.

Male surgical wards.

Female surgical wards.

Colored male surgical and medical wards.

Colored female surgical and medical wards.

Male isolating wards, medical and surgical.

Female isolating wards, medical and surgical.

Isolating ward for colored male and female.

Children's ward, if the number justifies it.

RELIGIOUS MINISTRATION.

The general character of the Hospital, will
 Page 52. be such, that but few patients will be physically able to attend stated religious gatherings.

Convalescents and attendants being of various religious beliefs, would prefer to attend their own neighboring churches. It is different in Hospitals located in the country, or in Hospitals for chronic cases.

CONNECTION WITH MEDICAL SCHOOL.

The connection between Medical School
Page 53. and Hospital will always command the services of *attending physicians* of the highest standing.

The Medical School and Hospital *nominally* and in *organization* should be distinct.

The welfare of the patients is the first consideration in the Hospital—avoid as far as possible all prejudices in the community against the connection of the Hospital with the School.

The students are only allowed to visit as a privilege, dependent upon their considerate demeanor. Professors as such, have no absolute rights which patients are bound to respect against their will.

This will work to the benefit of both Hospital and School and refine the relations between students and patients.

CONVALESCENT HOSPITAL.

Country wards are an important feature of
Pages 54 to 56. the Hospital, and they should be used also for chronic consumptive cases. He would erect a simple two story building—well ventilated—with a furnace for damp and cold days. *Location all-important*, if on a rail road, have the litters the width of a car door.

A resident Medical officer could be taken in summer, by turns, from the officers of the City Hospital, a month at a time.

If the distance is far from the city, visiting or consulting Physicians in the neighborhood could be invited to act.

PROXIMITY OF MEDICAL SCHOOL.

The Medical School should be separate
 Page 56. and apart from the Hospital grounds, but within a few minutes walk. The students should reach the Hospital easily in cases of accident, poisoning, &c. and lose as little time as possible from their studies.

The advantages to a Hospital from connection with a Medical School are few—but the advantages to the School are great—instruction in a Hospital is an indispensable part of thorough medical education.

TRAINING SCHOOL FOR NURSES.

He is strongly of the opinion that the
 Page 57. Hospital should be the Training School, and that a separate organization and management in a well regulated Hospital, is more or less detrimental to the economies of the latter, and to the excellence of the nursing. The *esprit de corps* should be that of the Hospital, not of a separate educational body.

He thinks little of didactic teaching for nurses, and much of practical experience. Devote time and money to raising the standard of the service—engage better women and employ more of them to do the same work.

The name of Training School has only the advantages of attracting a better class of women.

INSTRUCTION OF NURSES should proceed from
 Page 58. the officers of the Hospital, and should grow out of the daily experience of the wards, care being taken, as above stated, to secure variety of experience to each nurse. The Matron, under the authority of the Resident Physician, is the natural supervisor of nursing—and in a

large Hospital, this duty might well be in the hands of a special subordinate. There are various matters in which systematic instruction is necessary, and this should be given by the Head Nurses of wards to the assistant Nurses, as they come under their control, under the general direction of the Matron. The Medical Officers should also be expected to instruct the nurses so far as their demands and directions to them lead to it, and especially by holding them individually responsible for duties done in connection with particular patients.

"Holding these views," he says, "I have made ample provision in my plan, for the comfortable living of all the nurses likely to be employed, or taught at one time in the Hospital, *within the Institution.*"

ONE STORY WARDS.

Pages 58 to 60. "While I am not prepared to deny that sick people will get well rapidly in buildings of several stories, I am strongly of the opinion that one story wards are better, and that these should be detached as far as circumstances will admit. I do not know that there are statistics to prove this, I nevertheless believe it to be true." "One story wards are very convenient of administration. What can be done *easily* will be done *promptly.*"

His arrangements preclude the idea of a second story to any building occupied by the sick. One of the features of these wards, ridge ventilation, he says, was thoroughly tested in the war, and is now modified to suit a city Hospital.

He advises low pressure *steam heating*—using heated fresh air, which insures ventilation. Open fires are useful in mild weather, and are good ventilators—they are advisable in special rooms; thinks heat applied to ventilat-

ing shafts will be simpler and more economical than a fan.

Page 59. He does not consider *destructible* barracks

at all suitable for a private, civil institution.

The moral effects of such barracks is bad. If we provide for the renewal of the inner surface, the entire renewal is unnecessary. Advises the paving of the streets around the Hospital with wood to prevent noise.

ORGANIZATION FOR 400 BEDS.

Pages 60 to 63. Officers to be elected *annually* by the Trustees.

A Resident Physician, the Executive Officer, better than a non-medical superintendent. His duties include those of a steward and admitting physician, and he should have an assistant. Under the Trustees he should control the Hospital in all respects, except the treatment of patients, receive all moneys and make all purchases, settle his accounts monthly with the Treasurer, admit patients and fix rate of board, and appoint and discharge all employees not elected by the Trustees. He is responsible for the hygiene and discipline of the Institution. In the absence of visiting physicians and surgeons he acts in their stead—assigns patients to their proper wards and directs removal or change when necessary. He orders all autopsies in writing under the rules—reports annually to the Trustees.

A board of *Consulting Physicians and Surgeons*—eight of each—two of each serving at one time for three months. They have entire charge of the *treatment*.

Out-Patients' Physicians and Surgeons—four of each—who shall act as assistants to the visiting officers, if required.

An *Ophthalmic Surgeon*—special department, in and out-patients.

An *Aural Surgeon*—special department, in and out-patients.

A *Dentist*.

A *Pathologist*, he makes all autopsies and preserves specimens.

An *Assistant Physician*—the constant aid of the Resident Physician, and his representative when absent.

House Officers—sixteen. Medical students or recent graduates, eight medical, eight surgical, eight resident and eight non-resident, to serve two years, and eight to be elected each year.

Apothecary, he aids in purchasing drugs.

Matron, she supervises the housekeeping, and the nursing and training of nurses.

Then follows a list of persons employed by the Resident Physician, 124 persons in all.

Employ patients who are physically able to aid in the care of the wards. A small charge of board causes the patients to appreciate their advantages.

GENERAL PLAN OF BUILDINGS.

Plate No. 1 is a one story block plan, and Pages 63 to 67. is explained in detail by the author. The administration building fronts on Broadway—but the wards all have their main axes north and south—they are all on the same floor, without steps—the covered corridors in all cases follow the gradual slope of the ground, and thus place the wards vertically *en echelon* catching the prevailing winds. Every room receives sun-light some part of the day.

As the water from the condensed steam is to return to the boilers, the boiler house should be at the lowest part of the lot, and the Kitchen and Laundry should be placed as near the boiler as is practicable.

THE BEDS ARE THUS DISTRIBUTED.

1 Private ward of 20 separate rooms, . . .	20 beds.
14 General wards, 23 beds each, . . .	322 "
4 Isolating wards, each 16 beds in separate rooms, 64	"
	406 "

The 14 general wards being all alike they can be assigned to such various uses as circumstances might require, in classification. The four isolating wards are also alike. The corridors are all on the north side so as not to interfere with the southerly exposure of the buildings—the distance between wards is 60 feet east to west, and 70 feet north to south. The wards in each row are placed opposite to the intervals in the next row.

An open drying place for clothes *in the sun* is provided upon the roof of the house appropriated to Engine, Kitchen, &c.—the clothes to be lifted up.

The walls of all buildings to be of brick; with a closed air space, except in the corridors, where a single eight inch brick will be used, and painted outside to insure dryness. The wards to be simple—but there is opportunity for architectural effect in the administration building.

All corners and angles should be avoided—this is specially desirable at the floor, where the broom is apt to leave dust. Cove the wash boards. All floors should be laid in strips of hard wood two inches wide, and boiled linseed oil is the best way to treat them. The finish in wards to be perfectly plain.

See author for much valuable detail in this chapter.

GROUNDS AND PATHS.

Plate No. 27, at the close of his Essay, Pages 67 to 71. shows the course of the paths and the ground plan more fully than plate No. 1. A driveway 15 feet wide surrounds the whole lot with a double row of trees—the cross and connecting paths, are 10 feet wide, allowing the passage of carts all over the grounds. At the front or business entrance, is the porter's lodge—he directs all new comers: there are three diverging paths—applicants for admission and visitors take one—out-patients another, and students to the theatre take the third.

There is another entrance near the Boiler house—where all supplies, coal, scavenger carts, ice, hearses, &c. enter.

The physicians can reach the sheds for their carriages either way. There are enough paths for the exercise of patients.

A garden is provided at the east end—with arbors and fountain.

Level the elevation at the centre to that of the highest, the north-east corner, surround the buildings by hard gravel paths a few feet wide, and let the turf slope gradually from them to insure dryness.

Keep the drains from the buildings and let them enter the main one.

ADMINISTRATION BUILDING.

Plate No. 2 is a plan of the first story of Pages 71 to 75. this building and its appurtenances. The main part is 250 feet long, and 50 feet wide—hall 12 feet wide—a front verandah 100 feet \times 8 feet.

Corridors from the rear of this building connect with the pavilions. The north end of the Administration

Building is appropriated to the Resident Physician and his family. Suitable rooms for the nurses, including a sitting room, in second story. The various business offices and rooms are detailed on the plate, and in the description of it on pages 71 to 75.

A patients' library—electric bells—speaking tubes, &c. are advised.

The second story, of which no drawing is presented, is appropriated to officers, employees and nurses' rooms. No wards for the sick in this building.

He gives special attention to construction and ventilation of water closets and presents detailed drawings of them.

A third story only at centre and ends of the buildings. The Basement for steam radiators, &c.

Water tanks should be provided for three days supply in case of accident—say 50,000 galls.

COMMON WARDS OR PAVILIONS.

Plate 3 will give the detailed drawing—
Pages 75 to 83. and pages 75 to 83 will explain the construction, heating and ventilation of a ward. These wards are permanent one story buildings with barrack roofs. The room is 56×43 and holds 23 beds.

A central chimney stack, six feet square, with two detached fire-places connected with it, of soapstone, and two registers for introducing fresh heated air on the other two sides of the stack, is the feature of the ward, with its nearly square shape, peaked roof and barrack ventilation.

He claims more privacy for each bed, as compared with its situation in a long hall without obstruction to the view; the absence of *draughts*, the fire-places and warm air supply being nearly equi-distant from all parts of the

ward, and the chimney stack by its volume and position interrupting and mixing accidental air currents; and the ease of administration, the beds being nearly equi-distant from the supplementary rooms of the ward.

He does not think that the attractive home-like character of such rooms, in comparison with long narrow wards, can be appreciated without seeing both in occupation.

The supplementary rooms are attached to the ward, except the dining room, which is on the opposite side of the corridor.

The cellars should be paved with asphalt, and devoted entirely to heating and ventilating apparatus.

The ceiling ventilation should only be used when rapid changes are necessary, as at the dressing hour of surgical cases, and in hot weather; the usual means of ventilation being the central chimney. Artificial heat is applied to the ventilating flue when necessary. Have two air ducts to each flue—one windward and one leeward, to be used according to the wind. By a valve the fresh air can be passed *over* the radiators instead of *through* them, if the room is too warm, and thus avoid shutting off the supply of fresh air.

In warm weather all doors, windows and openings should be used, so that the patients can live in the open air as much as possible. These wards are better than tents.

He gives a pattern of an iron bedstead two feet high—objects to low ones.

ISOLATING WARD.

Plate No. 12 gives the plan. The aerial
Pages 84 to 88. currents from other wards, are cut off by partitions across the corridors, of glass, swinging both ways. Corridors moderately warmed by direct radiators. The

windows should be wide open in moderate weather, and the sash lowered two inches in cold weather.

The isolating ward is $113 \times 37\frac{1}{2}$ feet, and has 16 rooms for one patient each. The administration of the ward is provided for at the centre. The patients' rooms are each 13×8 feet, with an open fire-place. The window and door opposite.

The entry running through and dividing the house is 7 feet wide and 24 feet high, and has a separate roof, like a car roof, with windows, which gives ridge ventilation for the whole building, when the rooms are open to the entry. Each room is also heated and ventilated as a unit whenever required. Explained by drawing and text.

There are cases of exceptionable character needing entire isolation—to supply this want in winter *sectional buildings* of wood should be kept on hand, to be put together by hooks and bolts—or *tents* in summer.

PRIVATE WARD.

Plate No. 16 gives the plan—shape of the
Pages 88 to 91. letter L, all the rooms front south, east or west; the administration rooms front north. One wing is 132×42 feet, and the other 80×48 ; 18 of the rooms for patients are 18×12 , and 14 feet high, and 2 of the rooms are $22\frac{1}{2} \times 17\frac{1}{2}$ in cases where a friend wishes to sleep in the room with the patient.

The introduction of water closets and water basins in the private rooms advised against. Ample provision can be made without them. Make these rooms like a private chamber at home.

Fire-places in each room—heating and ventilating by the same system as in other wards. See text.

KITCHEN.

Plate 17 represents the plan, and the text gives the detail of the equipment; size 50 feet square, including store-room and oven. Vegetable cellar below. All stores should be ordered in writing, and the card on which it is done should be presented to, and checked off by the store-keeper, and every thing weighed. Dining rooms in second story—one for nurses and the other for other employees—food taken up by dumb waiters. Ventilation to be amply provided in this building.

OPERATING THEATRE AND OUT-PATIENT BUILDING.

Plate No. 18 is the ground plan, and Plate No. 19 is the elevation of these buildings. They are accessible from each other from a corner of each being in contact. The out-patient building is 50×75 feet—the main room 50×40 , seating 200 persons. The Physicians' and Surgeons' rooms on either side, which the patients enter in turn upon a signal.

The operating theatre is 82×60 . The operating room 64×16 . The theatre will seat 500—more than will be present—except on special occasions, when all interested in the Institution may be called together. Beneath the seats are the usual rooms.

The lighting, heating and ventilating are fully explained.

AUTOPSY BUILDING.

See Plates 20 and 21. Building 52×42 . Autopsy Theatre 42×31 ; a Pathologist's room and two dead rooms.

A room for preservation of specimens on floor above.

Dead rooms kept cold, with stone floors, also Autopsy room. He describes in detail an Autopsy Table in use at Massachusetts General Hospital and gives a drawing of it.

JOSEPH JONES, M. D.

This Essay relates more to administration than to construction, and as this digest is made with reference to the latter, it will necessarily be brief.

First attention should be paid to the *surface* and *underground* drainage, which should be of the most ample and effective character.

The *sewers* should be large in size, simple in structure, and capable of easy examination and repair—and be built by a competent engineer. Two main sewers should cross the grounds, one in front and one in rear, four feet in diameter, and the smaller ones should run into them and be not less than two feet in diameter. They should be properly ventilated and not run under any Hospital building.

Water is the best disinfectant, and the best means of removing filth and noxious gases from the sewers, and the supply should be constant and unlimited. Fountains in the grounds will promote this largely.

A few supply *tanks* should be built, and no lead pipe used in the buildings or on the grounds.

Have the *gas-pipes* so arranged as to admit of frequent inspection.

BUILDINGS.

The axis of the wards should be so located as to secure the greatest amount of sunlight and heat, and the site should be such as to secure the prevailing winds.

Permanent buildings should be constructed upon the most substantial principles and be rendered fire-proof. The walls should be of impermeable material, Parian cement or porcelain slabs perfectly joined together. The floors should be fire-proof, covered with oil cloth or like material, so as not to absorb organic matters or gases, and be capable of frequent and easy washing.

Wooden buildings serve an excellent purpose in time of war and in great emergencies, but they have serious objections—danger of fire—requiring repair and renewal.

The chief objections to permanent Hospitals arise from faulty construction, over-crowding and neglect of periodical evacuation and disinfection.

In permanent Hospitals, one-twelfth of the entire ward space should be at all times vacant, and the twelfth or vacant ward should be fully ventilated, cleaned, disinfected and aired. This includes the furniture, and the renewal of the bedding. The chief sources of contagion is in the stuffing of the beds. The hygiene of a Hospital should commence with the bed.

FORM AND ARRANGEMENT OF BUILDINGS.

The Hospital should consist of a Central or
Pages 114 to 118. Administrative Building; the pavilions devoted to the reception and treatment of diseases and accidents; and the necessary rooms for Clinical Instruction and Pathological Investigation.

If the crowding of healthy men has its danger, the collection of many sick persons within the confined area of the Hospital, is far more perilous. The risks of aggregation are encountered in the Hospital in order that medical attendance and nursing, may be more cheaply, easily and perfectly performed.

An unlimited supply of air is the cardinal consideration, and should govern the construction of the buildings.

The sick should be distributed over as large an area as possible. He prefers natural to artificial ventilation. Sufficient ventilation can be obtained at any time by open doors and windows. The windows should be numerous, opposite each other, and should reach from the ceiling to the floor.

Pipes should bring fresh air, heated by coils of pipe, into a box under each bed. For the exit of foul air channels in the ridge should be provided, heated by gas. The air must be continually changing, without creating drafts. The supply of water must be at least 65 gallons per head daily, for all purposes.

The Wards must be erected on arches—this lower corridor can be used as a common highway, with a tramway. Lifts and stairways to communicate with the wards above. He proposes the usual accessories to the ward as per plate No. 4.

HEATING.

Of all exciting causes of disease, there are none more common than sudden and extreme changes of temperature, and the buildings and heating should be able to guard against this. However huts and wooden buildings may have served for armies, they are not adapted to destitute sick of large cities.

One of the first requisites in treating the sick poor is maintaining heat in cold weather, and the degree of heat should vary in accordance with the condition and class of diseases treated in the different wards. About 60° is generally adapted to the sick, but no arbitrary rule should be enforced.

Two large open fire-places for radiant heat in each ward.

Prefers hot water to steam—as the former is more under control and not liable to explosion.

DISINFECTION.

He urges disinfection strongly, and goes into the subject in detail, as regards the mode, the materials to be used, and the results.

HOSPITAL ADMINISTRATION.

The general medical and surgical management, the classification and distribution of patients, and the general direction of the hygiene and nursing of the Hospital should be entrusted to a Resident Surgeon. He should be directly responsible to the President and Trustees. He should reside permanently in the Hospital, and be eminent for both surgical and medical attainments, and administrative ability. *The success of the Hospital mainly depends on the administrative ability of the Resident Surgeon.*

An assistant Resident Surgeon should be appointed, and in the absence of the Resident Surgeon he should be clothed with his authority and act in his place.

The applicants for the position of Resident Hospital Student should be subjected to a rigid written examination, and all the answers written out in a room in which there can be no access to books or persons. The position is one of honor and trust. He goes into much valuable detail on this subject.

He advises the appointment of a Pathological Chemist and Microscopist.

He recommends the appointment of a Librarian of learning and ability, and the establishment of a Medical Library for the purposes of research and study, but no book to be taken out of the Library. Also the appointment of a Curator and the establishment of a Museum.

NURSES.

He does not think a separate school for
 Pages 141 to 144. Nurses is needed, the proper place for instruction is in the ward with patients—if thought advisable, some instruction could be given at intervals by the Resident Physician or attendant Surgeons in the theatre, accompanied by examinations. The nurses should not be less than 25 years of age.

He advocates the employment of female and not male nurses, as the result of his experience. They should not sleep in dormitories, but in comfortable rooms. If their health and strength be not carefully husbanded, their efficiency will sooner or later be impaired.

VISITING PHYSICIANS AND SURGEONS.

They should receive liberal and just compensation for their services, and should be held
 Pages 144 to 146. to a rigid accountability for the discharge of their official duties. They should have nothing to do with the administration of the Hospital. They should treat the sick and wounded, and give clinical instruction to the resident Hospital Students—and to the Students of the Medical School of the University.

DISPENSARY.

Page 146. Out-door patients should be prescribed for
in the central administrative building.

MEDICAL SCHOOL.

Page 147. Should be very near the Hospital. Its Pro-
fessors may at the same time be visiting
Physicians and Surgeons in the Hospital. The Hospital
Library and Museum may serve for the Medical School.

He has a carefully prepared chapter on cooking and diet.
He places the kitchen in the centre so as to be reached
from all the wards.

CASPAR MORRIS, M. D.

Pages 175 to 193.

“The plan presented as the basis of this paper is essentially that of the Hospital of the Protestant Episcopal Church of Philadelphia.” Having participated in the conferences over the plans adopted, and watched the practical working in conformity with them, he offers them with some changes to meet our special requirements, and others which present themselves to him as improvements.

A city Hospital must be adapted to the requirements of city life and must be constructed on the same principles as the city itself.

The more ample the supply of light and air, and the more space to each individual, the more robust the health; provided in securing these one does not sacrifice other interests, each important, though not in the same degree.

The sick and wounded of cities must submit to concentration to secure advantages which cannot be had without such sacrifice, and this concentration is in great contrast with the dark and illy ventilated rooms and houses of the poor.

Each head nurse should have from 24 to 30 patients in one ward—this ward is indeed a hospital in itself.

The question is shall these wards be spread out on one level, by space double the height, or shall the same amount of floor and air space be furnished by placing one ward on top another.

The consideration of permanent or temporary buildings is distinct from that of the number of stories.

The cost of grading, sewers, arrangements for lighting, distribution of food, and roofing is the same for one and

two story buildings. The cost of nursing and administration is much larger in the one story.

The objection to placing one ward over another is on account of the supposed facility for the transmission of foul air from one to the other, and on account of ridge ventilation not being had by the lower ward.

The transmission of miasmal influence is the same in an upward and lateral direction. It is carried by currents of air, or on clothing, sponges, dressings and instruments. The currents should be *from* the corridors *into* the wards and out the ventilating shafts to prevent this transmission of disease.

There should be no channels of communication between wards, which it is possible to dispense with, and the warming and ventilation of each should be separate and independent.

Upper rooms are more light, airy, cheerful and healthy. The controversy is still actively urged as to the merits of permanent or temporary Hospitals. There is no doubt of the fact that walls improperly built, floors badly laid, furniture dilapidated, and bedding foul from effluvia and discharges become contaminated and render the air unhealthy. Such results can only be averted by the maintenance of the integrity of structures and by cleanliness.

"Vigilance essential to success," should be the motto of Hospital management.

That which makes the healthiest house makes the healthiest Hospital.

Hospitalism is not confined to old buildings—cheap barracks may have more cracks in them in a year or two, than old well constructed buildings.

Temporary structures may be pitched for some cases, that require isolation, especially for amputations.

Another class, consisting of offensive discharges, &c. should be provided in a ward in the attic of two story pavilions around the central chimneys.

Here follows some very interesting extracts from a pamphlet published by Dr. Tilton of Delaware in 1813, giving his experience with tents and log-houses during the Revolutionary War. He was well satisfied with them.

GENERAL CONSTRUCTION.

Secure all the elevation of the ground by Pages 193 to 206. placing the central building on the level of the highest point and grade with an uniform slope. Enclose the grounds with a brick wall three feet high, on which place an iron railing—grade to the top of the wall. Widen Monument Street like Broadway, and make that the front.

Have four separate pavilions, each containing a surgical and medical ward. Let every arrangement look to air and light—let the main axis be north and south.

The general administration building should be in the centre—easy of access. Its exposure unimportant.

A Hospital should have an expression of comfort, inspiring a sense of repose and tranquillity and hope of restoration of health, ornament out of place.

Devote first year to grading of grounds, foundations, sewers and drains—protecting them against the winter.

Wooden buildings wholly inadmissible.

Pay great care to have good hard floors, oil and stain them—avoid rugs, carpets, &c. The naked floor best. See that all water and gas pipes, bell and telegraph wires are well laid. Double glaze north windows. Inside slatted window shutters. Outside awnings for windows now much used. Have window seats of polished slate—

suitable for flowers in pots. Every Hospital should have a green-house, and the plants should not be cut, but brought in in pots.

The superintendent, matron, resident medical officers and apothecary should form one family - one parlor and one dining room in common; while the other employees and servants will have similar apartments in basement.

There are four services essential to the Hospital administration, detached from the wards, requiring special buildings. Two of these, the *general supervision* and the *apothecary's rooms* may be together in the central building; the other two are the *kitchen*, and the *heating buildings*.

A yard for drying clothes in the sun is essential.

The plans and descriptions of the Buildings are given in detail at close of the essay—the pages 263 to 268.

WARD.

The Ward is the Hospital, and must be under the care of a head nurse, and the aggregation of wards must be under one superintendent. The size of the ward is governed by the number one nurse can oversee. The parallelogram form is the best. Adjuncts and offices are necessary to each ward—the plates show them. Stairs of stone and easy, so as to dispense with *lifts*.

A supply of light movable screens to each ward.

A ward refectory for convalescents—all who can should take meals there. A *reading and sitting room* for convalescents, with games, books, &c.

The water-closets, bath-rooms, &c. require the most care in construction -details given. He places a water-closet at each end of the ward and one *isolating room* at south end of each ward.

CORRIDORS AND VERANDAS.

Wards must be connected by corridors—
Pages 214 to 220. large and airy—open in summer and heated in winter. None should be made parallel to the wards. Open verandas on the south side of the corridors and at the south end of the wards, for convalescents, are useful. He urges good iron bedsteads, hair matrasses and blankets, also a chair to each bed as a relief to patients.

Foul clothes to be taken up in a closely fitted copper box and sent down in a hard lined shute.

BASEMENT AND ITS USES.

A lofty, enclosed, well lighted and well
Pages 220 to 222. ventilated basement, partially underground, with a wide area and sloped embankment should underlie every part of a hospital. No wooden floor should be allowed in any part of the basement. No cases of disease should ever go there but *mania à potu*. The rooms can be used for vapor baths, store-rooms for spirits, clothes of patients, &c.

The Kitchen, a separate building, should be on a level with the basement, also the laundry and ash-pit, and the room for the dead. These advantages are lost if there are open basements, and the floors above would be much colder in winter.

Under each pavilion and under its basement construct a tunnel through which steam, water and gas-pipes shall be carried. The basements are used also for the heating apparatus.

DRAINAGE.

He urges great attention to drainage. All drains and sewers should be laid outside of walls. Ventilate them to prevent reflux of gases. Rain spouts entering sewers will act as escapes for gas. The whole system of drainage and sewerage should be laid out before any thing else is done.

HEATING AND VENTILATION.

Heating and ventilation are inseparably connected. He considers open fire-places of primary importance. A Hospital ward without them is radically imperfect; they are essential to secure drafts from the corridors into wards, and the air in the corridors must be heated.

Other ventilating flues must be introduced communicating with a ventilating shaft. There are times, he says, when the air is the same temperature inside the wards and out, when *fans* must be used—"though there are Hospitals supplied with the fan which have never used them."

There must be auxiliary heat—other than open fires—heated air to supply the demands of the open chimneys. He advises air chambers in the basement heated by steam coils, to discharge the air near the doors. He disapproves of hot water, as the circulation cannot be maintained at distant points and advises high pressure steam. Direct radiation may be used in basement.

FOOD.

Diet is as important as drugs. Special
Pages 236 to 239. attention should be paid to the culinary department in the purchasing and cooking of food—the very best cooks should be employed.

The Kitchen should be in a central position—not in an upper story, but in the basement. It should be large and fire-proof, with hoods to carry off the steam, heat, and odor.

ADMINISTRATION.

It consists of three departments, *professional*, *executive* and *nursing*.
Pages 239 to 242. The house resident physician should be relieved of the professional care of the sick.

It has been established by usage, wisely or not, that medical and surgical advice should be rendered to Hospitals without compensation—and there is no lack of volunteers—four of each branch, medical and surgical, and the appointments should be annual.

A resident physician to each ward. The ultimate election of all officers and physicians should be in hands of Trustees.

Telegraphic communication with Central Police Station and the business office, should be established.

NURSES.

A nurse with common sense and faithfulness is preferable to one instructed in the principles of medicine without these qualifications.
Pages 243 to 245.

A *training school* for nurses is an important adjunct to the Hospital. One head nurse to each ward, who is to be held responsible for it. She should have assistants according to the nature of the cases, and not according to numbers. The supervision of the nursing of all the wards should be committed to one superior--and she should be the principal of the training school, which should be in the third story of the administration building.

THE SUPERINTENDENT.

Pages 245 to 247. More will depend upon the Superintendent for the success of the Hospital than upon the Trustees or the rules. He must have no part in the medical and surgical service of the house.

MATRON.

Page 247. She should have no connection with nursing--should look after the stores of bedding--laundry--kitchen--and all parts, except the wards, which come under the care of the head nurse.

This and the preceding section should be read carefully from the book.

MEDICAL SCHOOL.

Pages 247 to 250. No one can deny that a Hospital not used for teaching is an advantage to the sick--but it is necessary to have such teaching, and the Founder of this charity has so ordered it for the good of the common humanity--and every patient who accepts the charity is bound to return the service. The relations thus established should be guarded on both sides. The sick should be

guarded from improper intrusion, and the police of the Hospital should be maintained, under the invasions of students.

He proposes a lecture room and operating theatre, the access to which is entirely without the Hospital, yet in connection with the wards. To the general wards only the advanced students should be admitted, and only in small bodies.

The location of the Medical School of the University does not belong to Hospital arrangements, and cannot be discussed in connection with it.

DISPENSARY.

It is an associated agency rather than an integral part of the Hospital, and should be under the charge of a distinct medical and surgical staff, and have a separate entrance—also have a separate apothecary. There should be a few specialties—such as the eye, ear, &c., and the opportunities should be given to the Dispensary staff to lecture on special cases to the Medical School at the theatre, without interfering with the staff proper.

TRANSPORTATION OF THE SICK.

Have telegraphic communication with the Central Police Station. Have in readiness one or more well-equipped ambulances, but use stretchers when the distance will admit of it, as they are preferable.

RELIGIOUS SERVICES.

Among all Christian people Hospitals for the relief of disease have been an outgrowth of religious philanthropy. However much the injudicious

obtrusion of religious services may be condemned, they cannot be rejected. The consolations of revealed religious truth are as much a humane duty as the provisions for bodily weakness and disease. Mr. Hopkins makes it an "*especial request*." Rules relating to this subject should be well considered and adopted before the opening of the Hospital, and once decided upon, should not be open to discussion.

A proper Committee should have charge of and direct this special subject. He gives further valuable advice under this head.

HOME FOR CONVALESCENTS.

Many difficulties surround this question.
Pages 257 to 262.

A location is preferable upon the water—next upon a rail road. It is easier to classify sick persons than convalescents—male and female, white and black, moral and immoral.

All good work would stop if we waited because of contingencies. Responsibility ceases with the exercise of reasonable care. Two separate buildings would simplify classification, but increase the cost. The profligate, profane and unworthy are admitted into the General Hospital, but, for the sake of others, should be excluded from a Convalescent's Home.

Twenty per cent. would be a liberal estimate of the proportion who would go to the "Home." Common dormitories—not isolated ones—are preferable for this purpose.

The requisites of a well ordered lodging-house are all that is needed. Verandas should be provided.

The charge should be committed to an intelligent Physician, Matron, and a few nurses and servants.

STEPHEN SMITH, M. D.

Page 271. He aims to establish general principles without going into details. The architecture of a Hospital differs so much from all other buildings, that its peculiarities can only be appreciated by those who have given it long and patient study, and *the success will depend on the perfection of details.*

PREPARATION OF THE GROUNDS.

Pages 273 to 278. Immunity must be secured from the evils of *ground air* and *ground water*. They are both generally very impure. The emanations from the soil are often most disastrous. Typhoid fever and similar diseases spread through the agencies of ground water. Drain and sewer pipes will not cure all the evil, but a system of ground ventilation into a heated shaft, very high and made ornamental, is necessary. The *soil* conduits should be very porous, and the *water* drains should be specially adapted to drainage.

SURFACE GRADING AND CULTIVATION.

Pages 278 to 282. He urges cultivation for health and beauty. The exposure and inclination of the grounds towards mid-day sun and the prevailing winds—thus securing sun-light, heat and currents of air. Man and vegetation are the complements of each other in their effects upon the surrounding atmosphere.

The plot should be cultivated to secure a large supply of vegetation and especially of trees. The foliage of trees

has the power of absorbing and rendering innocuous, poisonous emanations from the earth, and they modify the temperature and humidity of the surrounding air. The entire margin of the grounds and street pavements should be planted to screen the air that enters the grounds—also group trees in the large areas separating the southern and northern pavilions—but not dense enough to render the ground damp. The open spaces between the pavilions should be devoted to flowers—with occasional fountains.

DISTRIBUTION OF THE SICK OVER THE SURFACE.

On the aggregation of the sick depends
Pages 282 to 284. economy of construction and facility of administration, and reduces expense, but this aggregation of the sick tends to unhealthiness, and thus defeats the purpose for which a Hospital should be constructed.

The limits of healthful occupation of surface area will depend upon the constancy and certainty of the renewal of the air about the sick. It is possible to do this perfectly, but it would be expensive and complicated. We must attain the same results by means which are largely self-operating and inexpensive. The smaller number of persons to the acre the better. The French standard is 80 persons—you can make it 40; including the administrative force.

CLASSES OF SICK TO BE RECEIVED.

There can be no doubt that that Hospital
Pages 284 to 290. will soon be regarded as best arranged and managed which adapts its wards to the cure of special diseases, and so classifies its patients that each malady has

its appropriate and designated wards. The policy of mixing patients suffering from acute diseases, in the same ward, is wrong in theory, and pernicious in practice.

There are certain conditions of temperature, isolation, food, medicines, nursing, &c. which are peculiar to individual diseases, and which cannot be suitably provided in the aggregate.

Nor can we overlook the lesson as to the necessity of isolating many classes of diseases, which recent studies of the methods of propagation of acute affections by *germs* is teaching. We must adapt the wards to the special needs of the sick. Diseases must be classified according to their special peculiarities, and isolated.

We cannot classify all diseases with precision, as we do small-pox and scarlet fever, yet the time has arrived when such *classification* must be recognized as the guiding principle of the distribution of the sick in wards.

Sex.—There should be two groups of wards, completely isolating the sexes, viz: Northern and Southern.

Age.—One or more wards in each group for children.

Color.—Separate wards in each group for persons of color.

Pay Patients. - Isolating wards, with home comforts.

The following division of each group would be nearly in accord with our present knowledge:

1st.—Intensely infective, gangrene, erysipelas, pyæmia, &c.

2nd.—Fever, suppurations, &c., but complicated with above diseases.

3rd.—Acute, medical and surgical cases,—slight if any infective properties.

4th.—Chronic non-infective diseases, convalescents, &c.

Out-door Patients.—In basement of Pathological Building with access directly from the street.

BUILDINGS OF A GENERAL HOSPITAL.

Our first, and chief concern should be to secure an unfailing supply of pure and properly tempered air—for pure air is the best restorative in all forms of disease which human agency can provide. Miss Nightingale says, “the pavilion is a separate detached hospital which ought to have as little connection in its ventilation with any other part of the Hospital, as if it were really a separate establishment miles away.” “There should be nothing in common but the administration.” “The atmosphere of each pavilion, should escape into the open air as soon as possible.” She gives no form of structure, but it is very clear that the principles which she so concisely lays down are the ones to be applied to the proposed General Hospital.

Dr. Smith's theory is the minimum number of patients to the acre, and classification according to sex, age, social condition and diseases, and he contemplates a series of temporary and permanent pavilions upon this arrangement.

TEMPORARY PAVILIONS.

The tent is the simplest and least expensive structure, and the results are more favorable than in permanent hospitals. It is easily adapted to summer and winter ventilation and heating. They should be used for highly infectious and offensive diseases, and the area per bed should be three times that of ordinary patients.

Wooden barracks is another form of temporary pavilions, and in construction should have the dimensions and arrangements of permanent wards—but they are not suitable for city use.

PERMANENT PAVILIONS.

There are two plans; the aggregation of wards in one building, or the segregation or entire separation of wards.

Pages 294 to 296. While he does not doubt that two story wards may be preserved in a fair state of healthfulness, especially if the stairways are external, yet by increase of surface population there are manifold liabilities which render it unwise, besides the cost of construction. The only plausible theory in their favor is the want of space in large cities. Modern scientific enquiries point to ample area, even if they have to go to suburban districts.

He advises permanent one story pavilions and quotes Miss Nightingale, who says—“the most healthy hospitals have been those on one floor only.”

If two stories are used, they should be only for non-infectious chronic cases and convalescents.

ARCHITECTURAL FEATURES.

Page 296. Hitherto we have studied too exclusively architectural effect. The exterior may be left to the good judgment of the architect, but the interior should have no ornamentation. There should be no renewal except perhaps the interior of the wall of the pavilion.

No substance should be used for floors, walls, or ceilings that does not admit of *rubbing*--he lays great stress on purifying by rubbing, and by strong currents of air.

DIMENSIONS.

The ward proper should be as follows:
Pages 296 to 299 length 80 feet; width 30 feet; height 16 feet; each bed should stand in a space 8×15 feet, removed two or three feet from the wall; and 12 feet from foot of opposite bed.

20 patients to the ward as a standard—more or less according to the class of diseases.

The *walls* should be of brick—and hollow—plastered on laths, hard finish and yet porous. Hollow walls are drier and can be disinfected. These walls can be washed down or the outer coating on laths removed and a new surface given.

The *basement* should be solid and dry, six feet above the ground, floored with asphalt or cement. The portion under the ward should be an air chamber—the coils of steam pipe distributed over all parts of it. The ceiling should be the floor of the ward above, with register openings to distribute the air into the ward.

WATER-CLOSETS.

He objects very much to the water-closets
Page 299. being connected with the wards—believes them to be a source of much danger. Upon a census taken at Bellevue Hospital, out of a total of 442 patients, 55 per cent. were able to traverse a flight of stairs, 23 per cent. were only able to walk the ward, and 22 per cent. could not leave their beds. He thinks the water-closets should be in the basement, under the accessories or on the grounds, for those who can walk up and down the base-

ment stairway; for those who can only walk the ward, he proposes earth closets in a room.

THE WARD.

The special features of the ward are the *Page 300.* *windows, the floors, the ceilings, the free end and the service rooms.* He does not place the windows opposite each other—thus the air from each window flushes the opposite bed, and the air of one bed is not conveyed to the one opposite.

The *Floors* should be of hard wood, treated with bees-wax, so as to be polished, and be put together with white lead or laid in parquetry.

Ceilings 16 feet high—can be higher with ridge ventilation, if desired.

He does not approve of towers or rooms at the end of the ward containing water-closet and bath-room, they should be free and open to light and air.

He would exclude the *Bath-Room*, except a general one, as it is rarely used except for filthy linen. He would substitute a portable bath for the really sick and a bed screen.

He would have the accessory rooms two stories, and would place a convalescent's day room, with books, &c. in the second story.

He has a covered *basement corridor*, for use in bad and cold weather, and an open walk on it from the ward floor, so as not to affect the air and light, between wards.

He prefers to arrange the pavilions on south side of the corridors, the long axis north and south.

Plate No. 2, gives his plan of a pavilion, *entirely* isolating the ward proper, from the accessory rooms, by a neck or closed passage, a new feature.

Séparate as widely and effectually as possible, the male and female portions of the General Hospital--the sexes must not intermingle even on the grounds.

His arrangement of wards is based on 400 patients.

HEATING AND VENTILATION.

The object sought is the constant removal
Pages 308 to 313. of foul air, and the constant supply of tempered fresh air, without noticeable currents. There are three modes. *Natural* ventilation where heated fire-places, windows and doors are relied on. *Vacuum*, or exhaustion of the air of the room by heated shafts. *Plenum*, or propulsion by a fan. In detached one story buildings, the first plan is best---in two or more story buildings, the vacuum or plenum ventilation is best. When we analyze the different modes of heating we find,

1st. The heating of the building itself, as the walls, floors, &c.

2nd. The heating of the air of the building.

3rd. The heating of air external, and drawing or forcing it in.

He thinks we overlook the first mode, and instances green-houses and tents where it is done. He does not speak highly of the fan.

ADMINISTRATIVE BUILDINGS.

One building must be devoted principally
Pages 314 to 316. to offices and to the residence of officers, accessible to the street and to the Hospital service.

The Kitchen should be a separate building, to relieve all other buildings of contamination by its emanations. This relief cannot be had in a basement of another building.

The Laundry, with its foul linen subjected to steam heat, should be in a separate building, or on the upper floor of the administrative building, as in the Hotels of New York. As we have ground enough he would advise the former.

MEDICAL SCHOOL.

The organized methods of Medical education in this country are very imperfect, and practically yield little more than elementary instruction. As they are supported by fees of students entirely, the lowest possible standard obtains.

All grades of students have to listen to the same lecture, and no oral examination is made, except at the option of the student. As the Johns Hopkins Medical School will be a part of the University, the Faculty of Medicine will be required to subject their students to the same tests as are required in the other departments. A school thus organized would be the centre of attraction to the profession in all parts of the country, and would assume a national character and importance.

MORTUARY, PATHOLOGICAL LABORATORIES AND MUSEUM.

One building can be arranged for these on the exterior of the grounds.

The operating Theatre should be isolated from the Wards, from the Kitchen, Laundry and Dead House.

CHAPEL.

The religious element is best impressed upon the management of a Hospital by the constant and consistent exercise of all those virtues which

belong to the Christian character, by officers and nurses in the daily discharge of their duties. The Chapel should be a separate building, and be used in the week for a school. There are always numbers in a General Hospital who need instruction.

TRAINING SCHOOL FOR FEMALE NURSES.

Every General Hospital should have a well organized training school for nurses as a part of its system of management. The best nurses met with in families are totally ignorant of that elementary medical knowledge which is the basis of the intelligent care of the sick.

A suitable building should be erected on a convenient part of the grounds—should accommodate the matron and the entire staff of nurses and assistant nurses, with dining, living and sleeping rooms.

The one in New York is on an adjoining street to the Bellevue Hospital, and has proved a marked success in every respect.

ADMINISTRATION.

There must be the most complete subordination of all departments to the governing Board, or its representative, and the most perfect harmony between these departments. Every act of insubordination must be promptly met and punished. All experience proves that all civil Hospitals must have something approaching military discipline. The administration may be thus divided—1st. Executive Duties. 2d. Medical and Surgical Care of the Sick. 3d. Nursing. 4th. Duties of Warden.

1st. There must be but one Executive Head, and he must be held rigidly responsible to the governing Board. He must be a medical man, thoroughly trained in Hospital practice, and of known executive ability. He should have no direction whatever of the medical and surgical treatment of patients, except in cases of emergency.

2d. The care and treatment of the sick should be under the exclusive control of the visiting and resident staff of physicians and surgeons. The visiting staff should constitute a Medical Board. They should prepare rules governing the resident staff and nurses, to be approved by the Board. The Medical Board should have no other disciplinary power, but suspension from duty. The resident medical staff should consist of three grades, viz: House Physician or Surgeon, senior assistant and junior assistant,—and they should live in the administration building.

THE DUTIES OF NURSING.

The entire charge of the nursing should be
Page 326. under the Matron, who should be the lady superintendent of the training school. Next, a chief nurse for the male and one for the female division. Two ward nurses for each ward—one for day and the other for night. Ward maids to do the cleaning and render assistance about the care of patients, two for each ward.

The candidates for nursing should be carefully selected, and the training should insure that intelligent subordination of the entire staff of nurses to rules and duty, which give discipline in the wards and effectiveness to the service. Nor should these duties be rendered onerous by too great confinement nor by over-work. They should be so

frequently relieved that they cannot become weary—and should sleep in their own apartments.

THE WARDEN.

Page 327. He should have supervision of the administrative department, and be responsible for the proper management of all its details.

